

AMENDMENT

IN THE CLAIMS

Please amend the claims as indicated in Appendix A submitted herewith according to the revision to 37 C.F.R. § 1.121 concerning a manner for making claim amendments.

REMARKS

Claims 1-6 are presently pending in the captioned application with claims 1 and 4 being amended and new claim 6 being added.

Claim 1 has been amended to recite that 4-hydroxyisophthalic acid and/or salicylic acid are constituent components of a liquid crystal polyester resin. Support for the amendment can be found in the specification at page 2, lines 14-17 and lines 28-33.

Claim 4 has been amended to depend from claim 3 thereby providing antecedent basis for the alkali metal salt.

Claim 6 recites a range of 5 to 100 mmol% for a recurring unit derived from 4-hydroxyisophthalic acid and/or salicylic acid. Support for claim 6 can be found in the specification at page 2, line 30.

No new matter within the meaning of § 132 has been added by any of the amendments.

Accordingly, Applicants respectfully request the Examiner to reconsider and allow all claims pending in this application.

1. Rejection of Claim 4
under 35 U.S.C. § 112, 2nd paragraph

The Office Action rejects claim 4 under 35 U.S.C. § 112, 2nd paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter of the invention. The Office Action states:

Claim 4 recites the limitation "the alkali metal salt" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Applicants respectfully traverse the rejection over presently pending claim 4. In particular, claim 4 has been amended to depend from claim 3, which provides antecedent support for an alkali metal salt. Therefore, antecedent support is provided to the alkali salt of claim 4 as well.

Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection of claim 4 under 35 U.S.C. § 112, 2nd paragraph.

Background

The purpose of this background is to provide a brief synopsis of the manufacturing process of para-hydroxybenzoic acid ("PHBA"), which is the starting material for the presently claimed liquid crystal polyester ("LCP").

Applicants' note that it is well known within the art that para-hydroxybenzoic acid ("PHBA") is produced by reacting an alkali metal salt of phenol with carbon dioxide via the Kolbe-Schmitt reaction. The PHBA resulting from this reaction is the starting raw material, which is then processed into LCP. However, prior to preparing a LCP from the resulting PHBA, one of ordinary skill in the art would most likely purify the resulting PHBA prior to using it as a starting material for LCP because of impurities that remain after the initial Kolbe-Schmitt reaction.

The by-products and unreacted components are:

- (1) Salicylic acid;
- (2) 4-hydroxyisophthalic acid ("HIP");
- (3) unreacted alkali metal salts of PHBA; and
- (4) Potassium sulfate.

Due to the presence of salicylic acid and HIP in the resulting PHBA, one of ordinary skill in the art would then further purify

the product of the Kolbe-Schmitt reaction to remove salicylic acid, HIP and any other by-products or reacted components. Notably, one of ordinary skill would consider the presence of impurities undesirable because alkali metal (potassium) has a catalytic function and thereby makes it more difficult to control polymerization. Therefore, as shown in commonly known product specifications, processes require that the alkali metal or other impurities be eliminated to the extent possible.

In other words, the PHBA used as a starting material for LCP in the cited references have a salicylic acid content and a 4-hydroxyisophthalic acid ("HIP") content of less than 1 mmol% and an alkali metal compound content of less than 10 ppm. In stark contrast, the presently claimed LCP composition specifically states that HIP and/or salicylic acid are present in at least 1 to 500 mmol% and an alkali metal content is present from 10 to 5,000 ppm.

Both these limitations are unanticipated by the cited references and are unobvious over their teachings.

2. Rejection of Claims 1-3
under 35 U.S.C. § 102(b)

The Office Action rejects claims 1-3 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,124,477 ("Suzuki et al."). The Office Action states:

Suzuki teaches a process for preparing PHBA (para-hydroxybenzoic acid) for use in liquid crystal polyester materials (LCP) by reacting an alkali salt of phenol with carbon dioxide via the Kolbe-Schmitt process wherein salicyclic acid is generated. Via the teaching of Suzuki, potassium salts are preferred. Thus potassium phenolate and potassium salicylates are utilized (3:63-4:9). The amount of the compound of formula I and/or formula II that is contained in the reaction system is specified in column 6, lines 26-37 wherein the amounts are specified in terms of the salts utilized and fall within the specified ranges of applicants claim 1.

Applicants respectfully traverse the rejection over Suzuki et al. because each and every claimed limitation is not taught either inherently or expressly by the reference. In particular, Suzuki et al. specifically fails to teach a LCP containing 1 to 500 mmol% of a recurring unit derived from 4-hydroxyisophthalic acid ("HIP") and/or salicylic acid and containing 10 to 5,000 ppm in terms of an alkali metal of an alkali metal compound. Moreover, any inherency analysis is prohibited because Suzuki et al. relates to the process of preparing para-hydroxybenzoic acid ("PHBA") rather than a liquid

crystal polyester ("LCP"). Finally, Applicants note that the Office Action's citation to col. 6, lines 26-37 of Suzuki et al. as teaching the recited ranges is incorrect insofar as the disclosed ranges are based on oxypotassium salt of phenolic potassium, which is completely different and separate from the recited limitations of the HIP and salicylic acid content.

Turning to the rule, the Federal Circuit has spoken clearly and at some length on the question of anticipation. Anticipation requires that each and every element of the claimed invention be disclosed in a single prior art reference. Verdegaal Bros. v. Union Oil Co. of California, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Those elements must be expressly disclosed as in the claim. In re Bond, 15 USPQ2d 1566 (Fed. Cir. 1990).

The prior art reference must also be enabling, thereby placing the allegedly disclosed matter in the possession of the public. In re Brown, 329 F.2d 1006, 1011, 241 USPQ 245, 249 (C.C.P.A. 1964). In order to accomplish this, the reference must be so particular and definite that from it alone, without experiment or the exertion of his own inventive skill, any person versed in the art to which it pertains could construct and use it. Id. at 250.

Finally, the Federal Circuit has made clear that a negative pregnant is not enough to show anticipation. Rowe v. Dror, 112

F.3d 473, 42 USPQ2d 1550 (Fed. Cir. 1997). Thus, where a reference does not explicitly describe anything inconsistent with a claimed use, if that reference nevertheless fails to make an affirmative suggestion of the claimed limitations, that reference cannot anticipate the claimed use. *Id.*

In the present application, independent claim 1 recites a liquid crystal polyester resin, which comprises 1 to 500 mmol% of a recurring unit derived from 4-hydroxyisophthalic acid and/or salicylic acid as a constituent component based on the total of all the recurring units and contains 10 to 5,000 ppm in terms of an alkali metal of an alkali metal compound.

Nowhere do Suzuki et al. teach any of the recited limitations as to a HIP or salicylic acid content. As noted supra in the background section, HIP and salicylic acid are considered within the art to be an impurity, which is most commonly removed from PHBA prior to its use as a starting material for LCP. In particular, PHBA specifications specifically require a HIP or salicylic acid content of less than 1 mmol% and further an alkali metal content of less than 10 ppm. Clearly, past LCP made from purified PHBA would not contain the presently claimed ranges of more than 1 mmol% of HIP and more than 10 ppm of alkali metal content.

Although Suzuki et al. does indeed state that the amount of

the compound of formula I and/or II that is contained in the reaction system may range from 0.2 to 30 equivalents, which seems to fall within the presently claimed ranges, Applicants' note that these ranges are calculated in terms of the equivalent of the potassium oxy radical based on the equivalent of the starting potassium phenolate. See Suzuki et al. at col. 6, line 31-33. The 0.2 to 30 equivalents range of Suzuki et al. is completely different from the presently claimed range for the amount of HIP, salicylic acid, and alkali metal content.

Applicants would also like to address any possible allegation that PHBA having those ranges are inherently disclosed by Suzuki et al. In particular, the Federal Circuit clearly held in Rowe v. Dror that a negative pregnant can never be the basis for an anticipatory reference. 42 USPQ2d at 1561. Although all the various types of PHBA may have been present, Suzuki et al. fails to affirmatively recite the presently claimed limitations directed to the content of what are commonly considered undesirable impurities.

Accordingly, Applicants respectfully submit that the presently claimed invention is not anticipated by Suzuki et al. and respectfully request the Examiner to reconsider and withdraw the S 102(b) rejection.

3. Rejection of Claims 1-3
under 35 U.S.C. § 102(b)

The Office Action rejects claims 1-3 under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 5,977,405 ("Samuels et al.").

The Office Action states:

Samuels teaches preparation of aromatic hydroxycarboxylic acids and dialkali metal salts wherein p-hydroxybenzoic acid (a salicyclic acid PHBA) is utilized as a monomer in making polyesters. The alkali metal aryloxides are usually prepared via the reaction of an aryl hydroxy compound such as phenol and an alkali metal containing base, such as sodium or potassium hydroxide (1:15-28). Again, the Kolbe-Schmitt process is utilized. Table 1 shows the usage of HIP and Salicylic acid in relation to the salts utilized.

Applicants respectfully traverse the rejection over Samuels et al. because the cited reference relates to methods for producing an aromatic hydroxyl compound whereas the presently claimed invention is directed to a novel and unobvious liquid crystal polyester ("LCP"). In particular, Samuels et al. specifically fails to teach a LCP containing 1 to 500 mmol% of a recurring unit derived from salicylic acid and containing 10 to 5,000 ppm in terms of an alkali metal of an alkali metal compound. All Samuels et al. really discloses is that an alkali metal aryl oxide can be used for the production of an aromatic hydroxyl compound.

Turning to the rule, the Federal Circuit has spoken clearly and at some length on the question of anticipation. Anticipation requires that each and every element of the claimed invention be disclosed in a single prior art reference. Verdegaal Bros. v. Union Oil Co. of California, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Those elements must be expressly disclosed as in the claim. In re Bond, 15 USPQ2d 1566 (Fed. Cir. 1990).

The prior art reference must also be enabling, thereby placing the allegedly disclosed matter in the possession of the public. In re Brown, 329 F.2d 1006, 1011, 241 USPQ 245, 249 (C.C.P.A. 1964). In order to accomplish this, the reference must be so particular and definite that from it alone, without experiment or the exertion of his own inventive skill, any person versed in the art to which it pertains could construct and use it. Id. at 250.

Finally, the Federal Circuit has made clear that a negative pregnant is not enough to show anticipation. Rowe v. Dror, 112 F.3d 473, 42 USPQ2d 1550 (Fed. Cir. 1997). Thus, where a reference does not explicitly describe anything inconsistent with a claimed use, if that reference nevertheless fails to make an affirmative suggestion of the claimed limitations, that reference cannot anticipate the claimed use. Id.

In the present application, independent claim 1 recites a

liquid crystal polyester resin, which comprises 1 to 500 mmol% of a recurring unit derived from 4-hydroxyisophthalic acid and/or salicylic acid as a constituent component based on the total of all the recurring units and contains 10 to 5,000 ppm in terms of an alkali metal of an alkali metal compound.

Nowhere do Samuels et al. teach any of the recited limitations as to a HIP or salicylic acid content. As noted supra in the background section, HIP and salicylic acid are considered within the art to be an impurity, which is most commonly removed from PHBA prior to its use as a starting material for LCP. In particular, PHBA specifications specifically require a HIP or salicylic acid content of less than 1 mmol% and further an alkali metal content of less than 10 ppm. Clearly, past LCP made from purified PHBA would not contain the presently claimed ranges of more than 1 mmol% of HIP and more than 10 ppm of alkali metal content.

Although Samuels et al. does indeed disclose in Table 1 at col. 12, line 27-35, a HIP range of 200 to 500 ppm, Samuels et al. nevertheless fails to teach each and every claimed limitation of presently pending claim 1. Samuels et al. must also teach 1 to 500 mmol% of a recurring unit derived from salicylic acid as a constituent component based on the total of all the recurring units

and 10 to 5,000 ppm in terms of an alkali metal of an alkali metal compound in order for Samuels et al. to be a proper anticipatory reference. Applicants further note that this teaching must also be in direct relation to a liquid crystal polyester, which is only quickly referred to in col. 1, line 21 regarding manufacture of polyesters. Clearly, this is not the type of disclosure anticipating the presently claimed LCP.

Accordingly, Applicants respectfully submit that the presently claimed invention is not anticipated by Samuels et al. and respectfully request the Examiner to reconsider and withdraw the § 102(b) rejection.

4. Rejection of Claims 1-3
under 35 U.S.C. § 102(b)

The Office Action rejects claims 1-3 under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 4,731,475 ("Tanimoto et al.").

The Office Action states:

Tanimoto teaches a method of making PHBA (para-hydroxybenzoic acid) by preparing p-disodium hydroxybenzoate to a disodium process with a secondary production of salicyclic acid (1:10-24). Powdered sodium carbonate may be used within the range of from 5 to 50% by weight in terms of phenol in a solution (2:3-14). P-disodium hydroxybenzoate and sodium chloride in the presence of a transition metal

powder are utilized as specified in the examples and abstract. Via the teaching of Tanimoto, sodium salts are preferred.

Applicants respectfully traverse the rejection over Tanimoto et al. because each and every claimed limitation is not taught either inherently or expressly by the reference. In particular, Tanimoto et al. is non-analogous art insofar as the teachings only relate to a phenol content in an aqueous solution, which has no bearing on the content of an alkali metal compound in LCP. In particular, the teachings of Tanimoto et al. relate to a process for producing solid disodium parahydroxybenzoate and not the process for producing PHBA.

Turning to the rule, the Federal Circuit has spoken clearly and at some length on the question of anticipation. Anticipation requires that each and every element of the claimed invention be disclosed in a single prior art reference. Verdegaal Bros. v. Union Oil Co. of California, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Those elements must be expressly disclosed as in the claim. In re Bond, 15 USPQ2d 1566 (Fed. Cir. 1990).

The prior art reference must also be enabling, thereby placing the allegedly disclosed matter in the possession of the public. In re Brown, 329 F.2d 1006, 1011, 241 USPQ 245, 249 (C.C.P.A. 1964). In order to accomplish this, the reference must be so particular

and definite that from it alone, without experiment or the exertion of his own inventive skill, any person versed in the art to which it pertains could construct and use it. Id. at 250.

In the present application, independent claim 1 recites a liquid crystal polyester resin, which comprises 1 to 500 mmol% of a recurring unit derived from 4-hydroxyisophthalic acid and/or salicylic acid as a constituent component based on the total of all the recurring units and contains 10 to 5,000 ppm in terms of an alkali metal of an alkali metal compound.

Nowhere do Tanimoto et al. teach any of the recited limitations as to a HIP or salicylic acid content. As noted supra in the background section, HIP and salicylic acid are considered within the art to be an impurity, which is most commonly removed from PHBA prior to its use as a starting material for LCP. In particular, PHBA specifications specifically require a HIP or salicylic acid content of less than 1 mmol% and further an alkali metal content of less than 10 ppm. Clearly, past LCP made from purified PHBA would not contain the presently claimed ranges of more than 1 mmol% of HIP and more than 10 ppm of alkali metal content.

Tanimoto et al. is a totally irrelevant insofar as the teachings only relate to the phenol content of 5 to 50 wt% in the

aqueous solution, which has no bearing on the content of an alkali metal compound in LCP.

Accordingly, Applicants respectfully submit that the presently claimed invention is not anticipated by Tanimoto et al. and respectfully request the Examiner to reconsider and withdraw the § 102(b) rejection.

5. Rejection of Claims 4 and 5
under 35 U.S.C. § 103(a)

The Office Action rejects claims 4 and 5 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,124,477 ("Suzuki et al.") or U.S. Patent No. 5,977,405 ("Samuels et al."), each in view of U.S. Patent No. 5,891,532 ("Furuta et al."). The Office Action states:

Suzuki teaches a process for preparing PHBA (para-hydroxybenzoic acid) for use in liquid crystal polyester materials (LCP) by reacting an alkali salt of phenol with carbon dioxide via the Kolbe-Schmitt process wherein salicyclic acid is generated. Samuels teaches preparation of aromatic hydroxycarboxylic acids and dialkali metal salts wherein p-hydroxybenzoic acid (a salicyclic acid PHBA) is utilized as a monomer in making polyesters. The alkali metal aryloxides are usually prepared via the reaction of an aryl hydroxy compound such as phenol and an alkali metal containing base, such as sodium or potassium hydroxide (1:15-28). Again, the Kolbe-Schmitt process is utilized.

Neither Samuels nor Suzuki teaches the LCP resin the materials made are utilized in, only to say that each is for use in LCP resins.

Furuta teaches a LCP as specified in claim 5 wherein recurring units I, II and III are shown in columns 4-7 wherein it is taught that preferred combinations include polyesters from groups I and II which are as shown by applicants.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the polyesters of Samuels or Suzuki and utilize them in the resin copolyesters of Furuta as both Suzuki and Samuels teach the materials made by the Kolbe-Schmitt process to be for use in any LCP resin material.

Applicants respectfully traverse the rejections because the cited references alone or in combination fail to teach and every claimed limitation. As noted supra, Samuels et al. and Suzuki et al. fail to teach a LCP containing 1 to 500 mmol% of a recurring unit derived from HIP and/or salicylic acid and containing 10 to 5,000 ppm in terms of an alkali metal of an alkali metal compound. Both references simply fail to teach the base limitations.

Turning to the rule, the Federal Circuit held that a *prima facie* case of obviousness must establish: (1) some suggestion or motivation to modify the references; (2) a reasonable expectation of success; and (3) that the prior art references teach or suggest all claim limitations. Amgen, Inc. v. Chugai Pharm. Co., 18 USPQ2d

1016, 1023 (Fed. Cir. 1991); In re Fine, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988); In re Wilson, 165 USPQ 494, 496 (C.C.P.A. 1970).

However, even if a *prima facie* case of obviousness has been established, secondary considerations such as commercial success, long felt but unsolved need, failure of others, and unexpected results may nevertheless give rise to a patentable invention. Graham v. John Deere Co., 148 U.S.P.Q. 459 (1966). For example, evidence such as superiority in a property the compound shares with the prior art can rebut a *prima facie* case of obviousness. See In re Chupp, 816 F.2d 643, 646, 2 USPQ2d 1437, 1439 (Fed. Cir. 1987).

In the present application, independent claim 1 recites a liquid crystal polyester resin, which comprises 1 to 500 mmol% of a recurring unit derived from 4-hydroxyisophthalic acid and/or salicylic acid as a constituent component based on the total of all the recurring units and contains 10 to 5,000 ppm in terms of an alkali metal of an alkali metal compound.

Nowhere do Suzuki et al. teach any of the recited limitations as to a HIP or salicylic acid content. As noted supra in the background section, HIP and salicylic acid are considered within the art to be an impurity, which is most commonly removed from PHBA prior to its use as a starting material for LCP. In particular, PHBA specifications specifically require a HIP or salicylic acid

content of less than 1 mmol% and further an alkali metal content of less than 10 ppm. Clearly, past LCP made from purified PHBA would not contain the presently claimed ranges of more than 1 mmol% of HIP and more than 10 ppm of alkali metal content. Similarly, Samuels et al. also fails to teach any of the recited limitations as to a HIP or salicylic acid content.

Although Furuta discloses the LCP specified in claim 5 of the present application, this alone fails to render the presently pending claims obvious because the primary references Suzuki et al. and Samuels et al. fail to teach the base limitations from which claims 4 and 5 depend from.

Accordingly, Applicants respectfully submit that the presently claimed invention is unobvious over the cited references and respectfully request reconsideration and withdrawal of the rejections of claims 4 and 5 under 35 U.S.C. § 103.

CONCLUSION

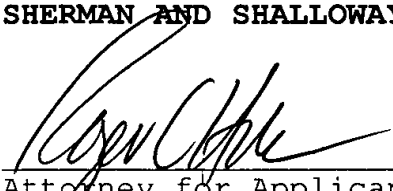
In light of the foregoing, Applicants submit that the application is now in condition for allowance. The Examiner is therefore respectfully requested to reconsider and withdraw the rejection of the pending claims and allow the pending claims.

Favorable action with an early allowance of the claims pending is earnestly solicited.

Respectfully submitted,

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Attorney Docket No. OHS-311
PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:)	Group Art Unit: 1756
)	
UENO; KITAYAMA; KOMETANI;)	Examiner: J. Sadula
KATO; UEDA)	
)	
Serial No. 10/009,613)	
)	
Filed: December 14, 2001)	
)	
For: LIQUID CRYSTAL POLYESTER RESIN		

Appendix A

Please amend the claims as indicated according to 37 C.F.R.
§ 1.121 concerning a manner for making claim amendments.

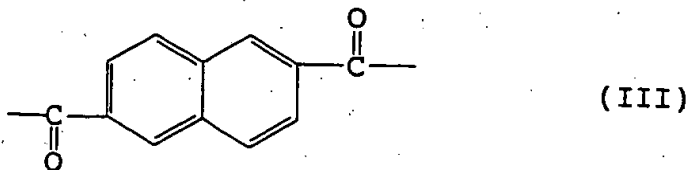
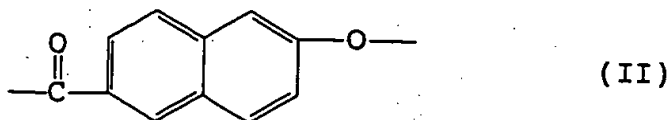
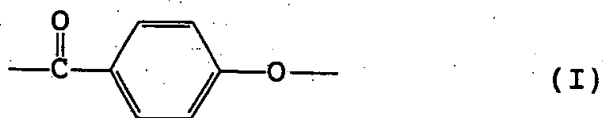
A₁ 1. (Currently amended) A liquid crystal polyester resin,
which comprises ~~comprising~~ 1 to 500 mmol% of a recurring unit
derived from 4-hydroxyisophthalic acid and/or salicylic acid as
a ~~comonomer~~ and constituent component based on the total of all
the recurring units and contains 10 to 5,000 ppm in terms of an
alkali metal of an alkali metal compound.

2. (Original) The liquid crystal polyester resin of claim
1, wherein the alkali metal is potassium and/or sodium.

3. (Original) The liquid crystal polyester resin of claim 1, wherein the alkali metal compound is at least one salt selected from the group consisting of a sulfate, carbonate, bicarbonate, nitrate, carboxylate and halogen salt of an alkali metal.

4. (Currently amended) The liquid crystal polyester resin of ~~claim 1~~ claim 3, wherein the alkali metal salt existent in the resin has an average particle diameter in terms of volume average particle diameter of 0.01 to 500 μm .

A1 cont.
5. (Original) The liquid crystal polyester resin of claim 1 which consists essentially of a recurring unit represented by the following formula (I) and at least one of a recurring unit represented by the following formula (II) and a recurring unit represented by the following formula (III):



6. (New) The liquid crystal polyester resin of claim 1,
 wherein the amount of the recurring unit derived from 4-
 hydroxyisophthalic acid and/or salicylic acid is 5 to 100 mmol%.

A2